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EXAMINER	
CALANDRA, ANTHONY J	

ART UNIT	PAPER NUMBER
1741	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/583,849	BUCHERT ET AL.	
	Examiner	Art Unit	
	ANTHONY CALANDRA	1741	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 8-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 8-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Office Action

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/17/2010 has been entered.

Claims 1-6 and 8-30 are currently pending.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 1-5, 8-18, 20-26, and 28-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 4, 6, 8-11, 13-154, and 16-20 of copending Application No. 10/583711. Although the conflicting

claims are not identical, they are not patentably distinct from each other because the instant claims claim binding an agent to pulp using an oxidative process. The copending claims claim binding a modifying substance to cellulose using an oxidant and then contacting the modified cellulose with a hydrophobic polymer. The modifying substance can both be electrically conductive and act as a modifier. The instant claims state that the bi-functional substance and the monomer can be the same substance [copending claim 12]. Alternatively the instant claims state a modifying agent can first be added and then a signaling agent can be bonded to the cellulose fiber. The copending claims state that conductivity is a signaling property (claim 9).

Instant claims 1, 2, and 8-12 see copending claims 1, 2, 6, 8, 10 and 11.

Instant claim 3 see copending claim 4

Instant claim 4 see copending claim 4.

Instant claim 5 see copending claim 19.

Instant claims 8-10 see copending claims 8, 10 and 11.

As for instant claim 13, the copending claims teach pulp fibers. Pulp fibers are either produced in chemical, mechanical, or chemimechanical (semi-chem) processes and therefore instant claim 13 is obvious in view of the copending application.

Instant claims 14, 16-18 see copending claims 13-14.

Instant claims 20, 28 and 29 see copending claim 20. Further it is *prima facie* obvious to optimize pH and temperature. Enzymes are known to have optimum pH's in which they operate most effectively.

Instant claims 21-24 see copending claims 16-18.

Instant claim 25, see copending claim 1.

As for instant claims 15 and 26 it is prima facie obvious to change the sequence of adding ingredients.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

2. Claims 1-5 and 8-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-12, 15-22, 23, 23, 26, 28-31, and 40 of copending Application No. 10/583712. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims claim binding an agent to pulp using an oxidative process. The copending claims claim binding a modifying substance to cellulose using an oxidant and then contacting the modified cellulose with a hydrophobic polymer. The modifying substance can both be electrically conductive and act as a modifier. The instant claims state that the bi-functional substance and the monomer can be the same substance [copending claim 12]. Alternatively the instant claims state a modifying agent can first be added and then a second agent can be bonded to the cellulose fiber. The copending claims state that conductivity is a signaling property (claim 12)

Instant claims 1, 2, 6-11, and 12 see copending claims 1, 5, 12 and 15-18.

Instant claim 3 see copending claim 3

Instant claim 4 see copending claims 2 and 3.

Instant claim 5 see copending claim 25.

As for instant claim 13, the copending claims teach pulp fibers. Pulp fibers are either produced in chemical, mechanical, or chemimechanical (semi-chem) processes and therefore instant claim 13 is obvious in view of the copending application.

Instant claims 14, 16-19 see copending claims 19-22.

Instant claim 20, 28 and 29 see copending claim 26. Further it is *prima facie* obvious to optimize pH. Enzymes are known to have optimum pH's in which they operate most effectively.

Instant claims 21-24 see copending claims 23, 28, and 29.

Instant claim 25, see copending claim 30.

Instant claims 15 and 26 see copending claim 31.

Instant claim 27 see copending claim 40.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

3. Claims 1-5, 8-10, 12-18, and 20-26 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-10, 12, 13, 15, 16, 18-22, and 24 of copending Application No. 10/583339. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims claim binding an agent to pulp using an oxidative process. The copending claims claim binding a modifying substance to cellulose using an oxidant and then contacting the modified cellulose with a hydrophobic polymer. The modifying substance can both be electrically conductive and act as a modifier. The instant claims state that the bi-functional substance and the monomer can be the same substance [copending claim 12].

Instant claims 1, 2, 8-10 and 12 see copending claims 1, 6-10.

Instant claim 3 see copending claim 3.

Instant claim 4 see copending claims 2 and 3.

Instant claim 5 see copending claim 4.

As for instant claim 13, the copending claims teach pulp fibers. Pulp fibers are either produced in chemical, mechanical, or chemimechanical (semi-chem) processes and therefore instant claim 13 is obvious in view of the copending application.

Instant claims 14, 16-18 see copending claims 12, 13, and 15-16

As for instant claims 20, 28 and 29 it is *prima facie* obvious to optimize pH and temperature. Enzymes are known to have optimum pH's in which they operate most effectively.

Instant claims 21-24 see copending claims 18-20.

Instant claim 25, see copending claim 21.

Instant claims 15 and 26 see copending claim 22.

Instant claim 27 see copending claim 24.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 19 and 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 19 and 27 are rejected based on the indefinite definition of nkat/g. The applicant still gives an undefined explanation for how this is calculated. This is in contrast to an art such as PEDERSON which specifically describes how to calculate the laccase enzyme activity in the publication:

"(37) *Laccase activity as defined herein is determined on the basis of spectrophotometric measurements of the oxidation of syringaldazin under aerobic conditions. The intensity of the violet colour produced in the oxidation reaction is measured at 530 nm.*

(38) The analytical conditions are: 19 .mu.M syringaldazin, 23.2 mM acetate buffer, pH 5.5, 30.degree. C., reaction time 1 minute, shaking. 1 laccase unit (LACU) is the amount of enzyme that catalyses the conversion of 1 .mu.M of syringaldazin per minute under these conditions".

In contrast the instant specification gives no applicable temperature, pH, time for acting or substrate which is acted upon.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-6, 8-10, 12-18, 20-26 and 28-29 are rejected under 35 U.S.C. 102(b) as anticipated by U.S. Patent 6,187,136 PEDERSON et al., hereinafter PEDERSON as evidenced by *Association constant of conductive poly(o-phenylendiamine) with halogenic ions* by YANO et al., hereinafter YANO.

As for claims 1, 2, 8-10 and 12, PEDERSON discloses a three step process where lignocellulose with phenolic groups is oxidized by way of an enzyme [abstract] and a bi-functional substance is attached to the fiber [column 5 lines 13-50]. Subsequent to the bi-functional monomer being attached a strengthening agent including polyacrylate is added to the mixture [column 9 lines 5-10].

PEDERSON discloses that the bi-functional substance can also be aromatic amines; aniline is an aromatic amine [column 9 lines 30-47]. In the case of combining using an aromatic amine, the amine will act as both a bi-functional substance and as a monomer for a polymer as it radicalizes in solution with the lignocellulose.

PEDERSON discloses phenylene diamine [column 9 lines 35-40] which has a plurality of functional groups including two second amine functional groups. Phenylene diamine contains a benzene ring with a NH2 group attached which the examiner has interpreted as a similar structural group to a substituted OH groups. YANO provides evidenced that the polymer of phenylene diamine is conductive [abstract]. PEDERSON also discloses phenolic compounds with carboxylic acid groups and one or more phenolic groups [column 5 lines 9-50].

As for claims 3, 4, 14 and 16-18, PEDERSON discloses using enzymes such as laccase and oxidase to oxidize lignocellulosic materials and modifying agents [column 6 lines 1-35].

As for claim 5, PEDERSON discloses a consistency of ~2% which falls within the instant claimed range [column 10 lines 14].

As for claim 6, the polymer of phenylene diamine [column 9 lines 35-40] is a derivative of aniline (one extra NH2 group) and will form polyaniline derivative when radicalized.

As for claim 13, PEDERSON discloses mechanical pulp [column 4 lines 57-67].

As for claims 15 and 26, PEDERSON discloses that the treatment can take place simultaneously or sequentially [column 4 lines 1-35].

As for claims 20, 28 and 29, PEDERSON discloses the temperature range of 20-80 degrees C which is the instant claimed range, and discloses a pH of 4-9 which falls within the instant claimed range [column 8 lines 31 and line 48].

As for claims 21-24, PEDERSON discloses peroxide, a chemical oxidizing agent, can be used in combination with the enzyme [column 8 lines 4-10].

As for claim 25, it is not clear the steps or the amount of radiation emitted onto the fiber, or consistency of the fiber. As paper web/pulp are subjected to light on a paper machine, at least some light radiation (including UV) strikes the pulp/paper web capable of oxidizing a phenol group. Examiner notes peroxide with ultraviolet light forms hydroxyl radicals, an advanced oxidation process.

6. Claims 1-4, 12, 23, 25-26 and 28-29 are rejected under 35 U.S.C. 102(b) as anticipated by U.S. Patent 3,522,158 GARNETT et al., hereinafter GARNETT as evidenced by *Structure analysis of conductive polymer systems, Poly-4-vinylpyridine and poly(butadiene-b-4-vinylpyridine) with 7,7',8,8'-tetracyanoquinodimethane* by Kempf et al., hereinafter KEMPF.

As for claim 1, 2, 12, 25, and 26, GARNETT discloses treating a lignocellulose in the presence of oxygen and under irradiation [column 2 lines 55-63]. GARNETT adds monomers [column 2 lines 5-10] to the mixture in order to graft them to the lignocellulose backbone [column 1 lines 55-60]. The monomers form polymers which are grafted onto the lignocellulose backbone [column 1 lines 55-60]. In this case the bifunctional substance which grafts onto the lignocellulose and the monomer which forms the polymer are the same. One example that

GARNETT gives is vinyl pyridine. The polymer of vinyl pyridine is conductive as evidenced by KEMPF [summary]. Vinyl pyridine has two functional groups as it can bond to the lignocellulose and also bond to the poly(vinyl pyridine polymer).

As for claims 3, 4, 21, 23, GARNETT discloses oxygen [column 2 lines 55-62]. The oxygen is in the presence of radiation which catalyzes the oxidation of radical groups [column 1 lines 70-73].

As for claim 13, GARNETT discloses mechanical pulp [column 3 example 4].

As for claims 28 and 29, GARNETT discloses 25 degrees C which falls within the instant claimed range [column 2 lines 45-50].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-6, 8, 9, 12-13, 15, and 21-26 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART.

As for claims 1, 2, 8, 9, 12, 15, and 26 BART discloses a process of treating a cellulosic pulp with an oxidant and a conductive polymer as to bond the conductive polymer to the cellulose fiber [abstract]. BART discloses the use of cellulosic fibers including high kappa fibers which contain phenolic structural groups [column 3 lines 53-55 and column 6 Table 1]. BART discloses treating the fibers with an oxidant to initiate polymerization including ammonium persulfate and ferric chloride [column 4 lines 5-9]. BART discloses the monomers acetylene, aniline, pyrrole, paraphenylene, and thiophene all of which have at least two functional groups [column 3 lines 65-67]. In addition to the above as for claim 8, aniline contains a benzene ring with a NH2 group attached which the examiner has interpreted as a similar structural group to a substituted OH groups. Aniline is a benzene ring with a NH2 group and phenol is a benzene ring with a hydroxyl group. In addition to the above as for claim 9, aniline has an amine functional group. Pyrrole has a secondary amine group.

The added monomer polymerizes onto the fiber and the concentration of the monomer is controlled such that further polymerization of the conductive polymer occurs on the fiber [column 8 lines 9-15]. In the teachings of BART the bi-functional substance and the monomer are the same.

BART adds the bi-functional monomer and then adds the oxidizing agent [column 11, line 65 - column 12, line 10]. Examiner has interpreted the addition of the oxidant directly after the addition of the monomer/bi-functional agent, to be a simultaneous addition. The oxidized fiber is contacted with the bi-functional substance/monomer and the fiber is not oxidized until the oxidant is added the addition necessarily occurs simultaneously. Alternatively, it would have been *prima facie* obvious to change the order of addition of the reactants [see e.g. MPEP 2144.04 (IV) (C) Changes in Sequence of Adding Ingredients].

As for claims 3, 4, 23 and 24, BART discloses the oxidation agent of ammonium persulfate [column 8 lines 20-25].

As for claim 5, BART discloses the consistency of 1.9 to 3.7% which falls within the instant claimed range [column 7 lines 10-14].

As for claim 6, BART discloses the conductive polymers of polyaniline and polypyrrole [column 8 lines 50-55]. BART also discloses the monomer acetylene and thiophene [column 7 lines 49-50]. The polymeric forms of these monomers are polyacetylene and polythiophene.

As for claim 13, BART discloses both low lignin chemical pulps and high lignin mechanical pulps [column 6 lines 55-62].

As for claims 21 and 22, BART discloses ammonium persulfate [column 4 lines 5-9]. Applicant states peroxide containing compounds are 'oxygen and oxygen containing compounds'. Ammonium persulfate is a peroxide compound and similarly releases oxygen.

As for claim 25, it is not clear the steps or the amount of radiation emitted onto the fiber, or consistency of the fiber. As paper web/pulp are subjected to light on a paper machine, at least some light radiation (including UV) strikes the pulp/paper web capable of oxidizing a phenol group. Examiner notes peroxide with ultraviolet light forms hydroxyl radicals, an advanced oxidation process.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART.

As for claim 11, BART discloses multiple conductive monomers can be used to form and conductive polymer bound to the fiber [column 3 lines 65-67]. If a person of ordinary skill in the art were to use a mixture of the monomer disclosed by BART then the monomer and bi-functional substance would be different. In some cases the first monomer would act as a bi-functional substance while the second monomer would bond to the first monomer and act as the conductive polymer. Conversely, the second monomer would also bond to the fiber while the first monomer would bond to the second monomer and act as the conductive polymer. It is *prima facie* obvious to combine equivalents known for the same purpose [see e.g. MPEP 2144.06 (I) Combining Equivalents Known for the Same Purpose].

9. Claims 14, 16-20, and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART, In view of U.S. Patent 6,187,136 PEDERSON, hereinafter PEDERSON.

As for claims 14 and 16-18, BART discloses that the bonding of the conductive polymers is accomplished by oxidation using a chemical oxidant [abstract]. BART discloses that other oxidants can be used to promote polymerization [column 8 lines 15-25]. BART does not disclose using an oxidative enzyme. PEDERSON discloses using enzymes such as laccase and oxidase to oxidize lignocellulosic materials [column 6 lines 1-35]. At the time of the invention it would have been prima facie obvious to substitute the chemical oxidant of BART for the enzymatic oxidant of PEDERSON. A person of ordinary skill in the art would be motivated to do so PEDERSON discloses that either chemical or enzymatic agents can be used to bind substances to lignocellulosic materials [column 1 lines 64-67]. It is *prima facie* obvious to substitute equivalents known for the same purpose [see e.g. MPEP 2144.06 (II) Substituting Equivalents Known for the Same Purpose]. In the instant case both chemical and enzymatic oxidants are known to graft chemicals onto lignocellulosic fibers. A person of ordinary skill in the art would expect the enzymes of PEDERSON to graft the monomers of BART onto the fiber.

As for claims 19 and 27, PEDERSON discloses 0.0001 - 10mg/g of dry matter which is the instant claimed range [column 6 lines 60-67]. The applicant claims an enzyme dosage nkat/g (nanokatal/g) which the examiner has interpreted as an enzyme activity on pulp. However, the applicant does not state what the defined assay conditions this enzyme activity is measured. At different temperatures an enzyme can have different activities. Therefore the examiner cannot determine the proper metes and bounds of patent protection desired by the applicant. PEDERSON discloses 0.02 LACU/g -2000 LACU/g [column 6 lines 40-47] of enzyme where an LACU is measured under disclosed conditions [column 6 lines 55-60]. PEDERSON

additionally gives a specific point of 3 LACU/g which equals 50 nkat/g and falls with the instant claimed ranges of claims 22 and 40 [column 10 line 10].

Until shown otherwise the examiner has interpreted these ranges to overlap with the instant claimed ranges [since the applicant fails to define the units].

Alternatively, at the time of the invention it would have been obvious to optimize the enzyme activity on pulp [2144.05 (II) (B) Optimization of ranges and result effective variables]. PEDERSON clearly shows enzyme activity on pulp to be a result effective variable and therefore its optimization would have been obvious to a person of ordinary skill, absence evidence of unexpected results.

As for claims 20, 28, and 29 PEDERSON discloses the temperature range of 20-80 degrees C which is the instant claimed range, and discloses a pH of 4-9 which falls within the instant claimed range [column 8 lines 31 and line 48].

As for claims 21-24, PEDERSON discloses peroxide, a chemical oxidizing agent, can be used in combination with the enzyme [column 8 lines 4-10].

As for claim 30, BART discloses derivatives thereof [column 3 lines 54-67] but does not state any specific derivatives. PEDERSON discloses that derivatives such alkyl and alkoxy groups work on phenolic components and it would be expected that said derivative types would also work on aniline components [column 5 lines 13-20].

10. Claims 19 and 27 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent 6,187,136 PEDERSON et al., hereinafter PEDERSON.

As for claim 19, PEDERSEN discloses 0.0001 - 10mg/g of dry matter which is the instant claimed range [column 6 lines 60-67]. The applicant claims an enzyme dosage nkat/g (nanokatal/g) which the examiner has interpreted as an enzyme activity on pulp. However, the applicant does not state what the defined assay conditions this enzyme activity is measured. At different temperatures an enzyme can have different activities. Therefore the examiner cannot determine the proper metes and bounds of patent protection desired by the applicant. PEDERSON discloses 0.02 LACU/g -2000 LACU/g [column 6 lines 40-47] of enzyme where an LACU is measured under disclosed conditions [column 6 lines 55-60]. Until shown otherwise the examiner has interpreted these ranges to overlap with the instant claimed ranges [since the applicant fails to define the units]. PEDERSON additionally gives a specific point of 3 LACU/g which equals 50 nkat/g and falls with the instant claimed ranges of claims 22 and 40 [column 10 line 10].

Alternatively, at the time of the invention it would have been obvious to optimize the enzyme activity on pulp [2144.05 (II) (B) Optimization of ranges and result effective variables]. PEDERSON clearly shows enzyme activity on pulp to be a result effective variable and therefore its optimization would have been obvious to a person of ordinary skill, absence evidence of unexpected results.

11. Claims 11 and 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,187,136 PEDERSON et al., hereinafter PEDERSON.

As for claim 11, PEDERSON discloses multiple conductive monomers can be used to form and conductive polymer bound to the fiber [column 9 lines 30-46]. If a person of ordinary skill in the art were to use a mixture of the monomer disclosed by PEDERSON then the monomer and bi-functional substance would be different. In some cases the first monomer would act as a bi-functional substance while the second monomer would bond to the first monomer and act as the conductive polymer. Conversely, the second monomer would also bond to the fiber while the first monomer would bond to the second monomer and act as the conductive polymer. It is *prima facie* obvious to combine equivalents known for the same purpose [see e.g. MPEP 2144.06 (I) Combining Equivalents Known for the Same Purpose].

As for claim 30, PEDERSON discloses that the bi-functional monomer can also be aromatic amines; aniline is an aromatic amine [column 9 lines 30-47]. The polymer of phenylene diamine [column 9 lines 35-40] is a derivative of aniline (one extra NH2 group) and will form polyaniline derivative when radicalized. PEDERSON discloses that derivatives such alkyl and alkoxy groups work on phenolic components and it would be expected that said derivative types would also work on aniline components [column 5 lines 13-20].

12. Claims 1-6, 8-11, and 13-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,187,136 PEDERSON et al., hereinafter PEDERSON, in view of U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART.

As for claim 1, 2, 8-11, PEDERSON discloses a three step process where lignocellulose with phenolic groups is oxidized by way of an enzyme [abstract] and a bi-functional monomer is attached to the fiber [column 5 lines 13-50]. Subsequent to the bi-functional monomer being

attached a strengthening agent including polyacrylate is added to the mixture [column 9 lines 5-10]. PEDERSON discloses phenylene diamine [column 9 lines 35-40] which has a plurality of functional groups including two second amine functional groups. Phenylene diamine contains a benzene ring with a NH2 group attached which the examiner has interpreted as a similar structural group to a substituted OH groups. PEDERSON also discloses phenolic compounds with carboxylic acid groups and one or more phenolic groups [column 5 lines 9-50].

PEDERSON does not disclose adding the polyacrylate as a monomer and it is not clear if polyacrylate acts as a conductive polymer. BART discloses treating pulp with conductive monomers and with oxidative compounds [abstract]. At the time of the invention it would have been obvious to a person of ordinary skill in the art to follow the strengthening treatment of PEDERSON with the conductivity treatment of BART absence evidence of unexpected results. A person of ordinary skill in the art would be motivated to do so to have paper with increased both the increased strength of PEDERSON and conductive properties of BART [abstract]. Further, the person of ordinary skill in the art would expect the modifier added onto the pulp by PEDERSON to help attract and retain monomers and polymers of BART.

As for claims 3, 4, 14 and 16-18, PEDERSON discloses using enzymes such as laccase and oxidase to oxidize lignocellulosic materials and modifying agents [column 6 lines 1-35].

As for claim 5, PEDERSON discloses a consistency of ~2% which falls within the instant claimed range [column 10 lines 14].

As for claim 6, BART discloses the conductive polymers of polyaniline and polypyrrole [column 8 lines 50-55]. BART also discloses the monomer acetylene and thiophene [column 7 lines 49-50]. The polymeric forms of these monomers are polyacetylene and polythiophene.

As for claim 13, PEDERSON discloses mechanical pulp [column 4 lines 57-67].

As for claims 15 and 26, PEDERSON discloses that the treatment can take place simultaneously or sequentially [column 4 lines 1-35].

As for claims 19 and 27, PEDERSON discloses 0.0001 - 10mg/g of dry matter which is the instant claimed range [column 6 lines 60-67]. The applicant claims an enzyme dosage nkat/g (nanokatal/g) which the examiner has interpreted as an enzyme activity on pulp. However, the applicant does not state what the defined assay conditions this enzyme activity is measured. At different temperatures an enzyme can have different activities. Therefore the examiner cannot determine the proper metes and bounds of patent protection desired by the applicant. PEDERSON discloses 0.02 LACU/g -2000 LACU/g [column 6 lines 40-47] of enzyme where an LACU is measured under disclosed conditions [column 6 lines 55-60]. Until shown otherwise the examiner has interpreted these ranges to overlap with the instant claimed ranges [since the applicant fails to define the units]. PEDERSON additionally gives a specific point of 3 LACU/g which equals 50 nkat/g and falls with the instant claimed ranges of claims 22 and 40 [column 10 line 10].

Alternatively, at the time of the invention it would have been obvious to optimize the enzyme activity on pulp [2144.05 (II) (B) Optimization of ranges and result effective variables]. PEDERSON clearly shows enzyme activity on pulp to be a result effective variable and therefore its optimization would have been obvious to a person of ordinary skill, absence evidence of unexpected results.

As for claims 20, 28 and 29, PEDERSON discloses the temperature range of 20-80 degrees C which is the instant claimed range, and discloses a pH of 4-9 which falls within the instant claimed range [column 8 lines 31 and line 48].

As for claims 21-24, PEDERSON discloses peroxide, a chemical oxidizing agent, can be used in combination with the enzyme [column 8 lines 4-10].

As for claim 25, it is not clear the steps or the amount of radiation emitted onto the fiber, or consistency of the fiber. As paper web/pulp are subjected to light on a paper machine, at least some light radiation (including UV) strikes the pulp/paper web capable of oxidizing a phenol group. Examiner notes peroxide with ultraviolet light forms hydroxyl radicals, an advanced oxidation process.

As for claim 30, PEDERSON discloses that the bi-functional monomer can also be aromatic amines; aniline is an aromatic amines [column 9 lines 30-47]. The polymer of phenylene diamine [column 9 lines 35-40] is a derivative of aniline (one extra NH2 group) and will form polyaniline derivative when radicalized. PEDERSON discloses that derivatives such alkyl and alkoxy groups work on phenolic components and it would be expected that said derivative types would also work on aniline components [column 5 lines 13-20].

Response to Arguments

112 2nd rejections

The applicant maintains that in the present invention the laccase activity was determined using ABTS as a substrate at room temperature using a pH of 4.5. The applicant argues the

specific conditions. The applicant asks for reconsideration of the rejection in view of

evidentiary reference NIKU-PAAVULA.

The applicant now argues that the laccase activity was determined using ABTS as a substrate, at room temperature and using a pH of 4.5. This conflicts with the applicant's previous arguments dated 12/08/2009 which stated that the specific condition is determined based upon the specific conditions of each chemical reaction [pg. 4 lines 1 and 2] and then even conflicts with the sentence in the current arguments "*The specific conditions of each chemical reaction are described in the working examples so that enzyme activity can be calculated in katals for each condition*". Either laccase activity is determined based upon a specific set of conditions or on varying conditions.

Further, the applicant's specification makes no mention of this newly defined method of determining laccase based upon ABTS at a pH of 4.5 and room temperature anywhere in the specification. Therefore the applicant fails to provide support for the first interpretation.

The applicant's argument that the determination of enzyme activity is based on each individual experiment is not supported by written description anywhere in the specification. Even giving the applicant this argument the claim would still be rejected based on 112 2nd. Since the applicant lists multiple conditions at which the reaction can take place [pg. 8 lines 4-12] and multiple reactants the claim language has no limit as to what 'nkat' can define as activity will change depending on different conditions as such 'nkat' is defined relatively. A claim term must be defined based on a standard that is recognizable to the person of ordinary skill in the art not a moving target.

The art (NIKKU_PAAVOLA) provided by the applicant shows that an enzyme activity is defined at a specific temperature, with a specific substrate, at a specific pH, and specific time/substrate consumption [pg. 878 column 1 paragraph 1].

Art rejections

BART, alone

Applicant argues that the chemical polymerization of a chemical polymer is followed by a coating of a fibrous structure and therefore the polymerizing chemicals such as APS are never in direct contact with the fibrous material and therefore there is no oxidation of phenolic groups on the fiber.

BART states the fibers are oxidized by disclosing treating the fibers with an oxidant to initiate polymerization including ammonium persulfate and ferric chloride [column 4 lines 5-9]. BART discloses that the slurry of fibers is mixed with the monomer and polymerization occurs via addition of said oxidant [column 6 lines 30-35]. BART also discloses that for the coating embodiment the system can progress by either the absorption of the monomer or polymer

[column 7 lines 63-65]. The absorption of a monomer falls within the applicants 'bonding language. Therefore the applicant's argument that the fibers are never in contact with the oxidant is not well taken. Finally the examiner notes that bleached fibers may be treated with the process [column 6 table 1]; bleached fibers are oxidized fibers.

The examiner has interpreted the term bonding broadly as physical, chemical, or sorption (adsorption or absorption) bonding. This broad interpretation is supported in light of the specification which states that bonding as defined therein includes chemical, physical, or chemi-physical sorption [Specification lines 9-10].

BART in view of PEDERSON

Applicant argues that the chemical oxidants do not graft the monomer onto the fiber.

As stated early binding/bonding reasonably included absorption/adsorption in light of the specification. It is believed that the applicant means to limit the claims to a chemical type bond, however, the claims do not contain this limitation.

Applicant argues that the claim invention requires an oxidizing agent in the presence of an enzyme in step (a) and an oxidizing agent in step (c).

This argument is not commensurate with the claims.

PEDERSON, alone

Applicant argues that PEDERSON does not disclose that a modified fiber is polymerized in the presence of an oxidizing agent in such a way that one end of the polymer chain is attached to the primered matrix of the fiber.

PEDERSON discloses phenylene diamine. The applicant has shown that aniline polymerizes in the presence of oxidants [specification pg. 14 lines 5-10]. Phenylene diamine is aniline with a second NH2 group attached. The applicant also suggests that aniline is compatible with the activated bi-functional groups of the fiber [specification pg. 9 lines 1-6]

Therefore as aniline and the derivative phenylene diamine can polymerize and are compatible with the oxidized fiber PEDERSON meets the claim limitation when the bi-functional primer and conductive monomer are the same.

Applicant argues that claim 11 states that the bi-functional substance and monomer are different.

In the rejection to claim 11 the examiner suggests the combination of both phenylene diamine with other substances that PEDERSON states can be used. For example PEDERSON states that more than one type of phenylene diamine can be used. Therefore when using a combination of two types of phenylene diamine in PEDERSON one type can act as the bi-functional substance while the other phenylene diamine acts as the monomer.

PEDERSON in view of BART

Applicant argues that PEDERSON does not disclose a bi-functional group to be used as a primer to attach a conductive polymer.

PEDERSON discloses that a substance such as phenolic compounds with carboxylic acid can be bonded to the surface. This increases the charge of the fiber and allows other substances to better bond to the fiber via increased charge density [column 3 lines 25-30]. Therefore the person of ordinary skill in the art would expect the subsequent addition of the compounds of BART to be better attracted to the fiber of PEDERSON.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY CALANDRA whose telephone number is (571)270-5124. The examiner can normally be reached on Monday through Thursday, 7:30 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Daniels can be reached on (571) 272-2450. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Anthony J Calandra/
Examiner, Art Unit 1741